

# Secularization Theory and Religion

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# Online Appendix A: Data and Variables

In what follows, we provide more detail on our data and variables.

## Dependent Variables

We start with our two dependent variables, *Religious Attendance* and *Religious Belief*, both of which are based on data found in the combined 1981-2015 World Values Survey (WVS, 2015) and the 1981-2008 European Values Survey (EVS, 2015). There are six waves in the World Values Survey data and four in the European Values Survey data. The data were downloaded on August 2, 2017.

1. *Religious Attendance* is based on the following question (f028) in the WVS and EVS codebooks:

“Apart from weddings, funerals, and christenings, about how often do you attend religious services these days? More than once per week, once a week, once a month, only on special holy days, once a year, less often, or practically never?”

We reverse the original WVS-EVS scale for this variable so that higher values indicate higher levels of religious attendance. Aggregate data on *Religious Attendance* is produced by taking country-survey means. Ultimately, *Religious Attendance* is measured on a 1 – 8 scale, with 1 meaning that respondents practically never attend religious services and 8 meaning that they attend more than once a week. After cleaning, our data has the following summary statistics:  $N = 336$ ,  $\mu = 4.33$ ,  $\sigma = 1.29$ . WVS-EVS data for this variable are available for the following countries and years:

Albania [1998, 2002, 2008]; Algeria [2002, 2013]; Andorra [2005]; Argentina [1984, 1991, 1995, 1999, 2006, 2013]; Armenia [1997, 2008, 2011]; Australia [1981, 1995, 2005, 2012]; Austria [1990, 1999, 2008]; Azerbaijan [1997, 2011]; Bahrain [2014]; Bangladesh [1996, 2002]; Belarus [1990, 1996, 2000, 2008, 2011]; Belgium [1981, 1990, 1999, 2009]; Bosnia and Herzegovina [2001, 2008]; Brazil [1991, 2006, 2014]; Bulgaria [1991, 1997, 1999, 2005, 2008]; Burkina Faso [2007]; Canada [1982, 1990, 2000, 2006]; Chile [1990, 1996, 2000, 2006, 2011]; China [1990, 2001, 2007, 2012]; Colombia [1997, 1998, 2005, 2012]; Croatia [1996, 1999, 2008]; Cyprus [2006, 2008, 2011]; Czech Republic

[1991, 1998, 1999, 2008]; Denmark [1981, 1990, 1999, 2008]; Dominican Republic [1996]; Ecuador [2013]; Egypt [2001, 2008, 2013]; El Salvador [1999]; Estonia [1996, 1999, 2008, 2011]; Ethiopia [2007]; Finland [1981, 1990, 1996, 2000, 2005, 2009]; France [1981, 1990, 1999, 2006, 2008]; Georgia [1996, 2008, 2009, 2014]; Germany [1981, 1990, 1997, 1999, 2006, 2008, 2013]; Ghana [2007, 2012]; Greece [1999, 2008]; Guatemala [2004]; Hungary [1982, 1991, 1998, 1999, 2008, 2009]; Iceland [1984, 1990, 1999, 2009]; India [1990, 1995, 2001, 2006, 2014]; Indonesia [2001, 2006]; Iran [2000, 2007]; Iraq [2004, 2006, 2012]; Ireland [1981, 1990, 1999, 2008]; Italy [1981, 1990, 1999, 2005, 2009]; Japan [1981, 1990, 1995, 2000, 2005, 2010]; Jordan [2001, 2014]; Kazakhstan [2011]; Korea [1982, 1990, 1996, 2001, 2005, 2008, 2014]; Kosovo [2008]; Kyrgyzstan [2003, 2011]; Latvia [1990, 1996, 1999, 2008]; Lebanon [2013]; Libya [2014]; Lithuania [1997, 1999, 2008]; Luxembourg [1999, 2008]; Macedonia [1998, 2001, 2008]; Malaysia [2006, 2012]; Mali [2007]; Malta [1983, 1991, 1999, 2008]; Mexico [1981, 1990, 1995, 1996, 2000, 2005, 2012]; Moldova [1996, 2002, 2006, 2008]; Morocco [2007, 2011]; Netherlands [1981, 1990, 1999, 2006, 2008, 2012]; New Zealand [1998, 2004, 2011]; Nigeria [1990, 1995, 2000, 2011]; Norway [1982, 1990, 1996, 2007, 2008]; Pakistan [2001, 2012]; Peru [1996, 2001, 2006, 2012]; Philippines [1996, 2001, 2012]; Poland [1990, 1997, 1999, 2005, 2008, 2012]; Portugal [1990, 1999, 2008]; Romania [1993, 1998, 1999, 2005, 2008, 2012]; Russia [1990, 1995, 1999, 2006, 2008, 2011]; Rwanda [2007, 2012]; Saudi Arabia [2003]; Serbia [1996, 2001, 2005, 2008]; Singapore [2002, 2012]; Slovakia [1990, 1991, 1998, 1999, 2008]; Slovenia [1992, 1995, 1999, 2005, 2008, 2011]; South Africa [1982, 1996, 2001, 2006, 2013]; Spain [1981, 1990, 1995, 1999, 2000, 2007, 2008, 2011]; Sweden [1982, 1990, 1996, 1999, 2006, 2009, 2011]; Switzerland [1989, 1996, 2007, 2008]; Taiwan [1994, 2006, 2012]; Tanzania [2001]; Thailand [2007, 2013]; Trinidad and Tobago [2006, 2011]; Tunisia [2013]; Turkey [1990, 1996, 2001, 2007, 2009, 2011]; Uganda [2001]; Ukraine [1996, 1999, 2006, 2008, 2011]; United Kingdom [1981, 1990, 1999, 2005, 2009]; United States [1982, 1990, 1995, 1999, 2006, 2011]; Uruguay [1996, 2006, 2011]; Uzbekistan [2011]; Venezuela [1996, 2000]; Vietnam [2001, 2006]; Yemen [2014]; Zambia [2007]; Zimbabwe [2001, 2012].

2. *Religious Belief* is based on the following question (f050) in the WVS and EVS codebooks:

“Do you believe in God?”

*Religious Belief* is a dichotomous variable that equals 1 if an individual believes in God and 0 otherwise. Aggregate data on *Religious Belief* is produced by taking country-survey means. After cleaning, our data has the following summary statistics:  $N = 266$ ,  $\mu = 0.82$ ,  $\sigma = 0.18$ . WVS-EVS data for this variable are available for the following countries and years:

Albania [1998, 2002, 2008]; Algeria [2002, 2013]; Argentina [1984, 1991, 1995, 1999, 2013]; Armenia [1997, 2008, 2011]; Australia [1981, 1995, 2012]; Austria [1990, 1999, 2008]; Azerbaijan [1997, 2011]; Bangladesh [1996, 2002]; Belarus [1990, 1996, 2000, 2008, 2011]; Belgium [1981, 1990, 1999, 2009]; Bosnia and Herzegovina [2001, 2008]; Brazil [1991, 2014]; Bulgaria [1991, 1997, 1999, 2008]; Canada [1982, 1990, 2000]; Chile [1990, 1996, 2000, 2011]; China [2012]; Colombia [1998, 2012]; Croatia [1996, 1999, 2008]; Cyprus [2008, 2011]; Czech Republic [1991, 1998, 1999, 2008]; Denmark [1981, 1990, 1999, 2008]; Dominican Republic [1996]; Ecuador [2013]; Egypt [2001]; El Salvador [1999]; Estonia [1996, 1999, 2008, 2011]; Finland [1990, 1996, 2000, 2009]; France [1981, 1990, 1999, 2008]; Georgia [1996, 2008, 2014]; Germany [1981, 1990, 1997, 1999, 2008, 2013]; Ghana [2012]; Greece [1999, 2008]; Hungary [1982, 1991, 1998, 1999, 2008]; Iceland [1984, 1990, 1999, 2009]; India [1990, 1995, 2001, 2014]; Indonesia [2001]; Iran [2000]; Iraq [2004, 2012]; Ireland [1981, 1990, 1999, 2008]; Italy [1981, 1990, 1999, 2009]; Japan [1981, 1990, 1995, 2000, 2010]; Jordan [2001, 2014]; Kazakhstan [2011]; Korea [1982, 2008, 2014]; Kosovo [2008]; Kyrgyzstan [2003, 2011]; Latvia [1990, 1996, 1999, 2008]; Lebanon [2013]; Libya [2014]; Lithuania [1997, 1999, 2008]; Luxembourg [1999, 2008]; Macedonia [1998, 2001, 2008]; Malaysia [2012]; Malta [1983, 1991, 1999, 2008]; Mexico [1981, 1990, 1995, 1996, 2000, 2012]; Moldova [1996, 2002, 2008]; Morocco [2011]; Netherlands [1981, 1990, 1999, 2008, 2012]; New Zealand [1998, 2011]; Nigeria [1990, 1995, 2000, 2011]; Norway [1982, 1990, 1996, 2008]; Pakistan [1997, 2001, 2012]; Peru [1996, 2001, 2012]; Philippines [1996, 2001, 2012]; Poland [1990, 1999, 2008, 2012]; Portugal [1990, 1999, 2008]; Romania [1993, 1998, 1999, 2008, 2012]; Russia [1990, 1995, 1999, 2008, 2011]; Rwanda [2012]; Saudi Arabia [2003]; Serbia [1996, 2001, 2008]; Singapore [2002, 2012]; Slovakia [1991, 1998, 1999, 2008]; Slovenia [1992, 1995, 1999, 2008, 2011]; South Africa [1982, 1990, 1996, 2001, 2013]; Spain [1981, 1990, 1995, 1999, 2000, 2008, 2011]; Sweden [1982, 1990, 1996, 1999, 2009, 2011]; Switzerland [1996, 2008]; Taiwan [1994, 2012]; Tanzania [2001]; Thailand [2013]; Trinidad and Tobago [2011]; Turkey [1996, 2001, 2009, 2011]; Uganda [2001]; Ukraine [1996, 1999, 2008, 2011]; United Kingdom [1981, 1990, 1999, 2009]; United States [1982, 1990, 1995, 1999, 2011]; Uruguay [1996, 2011]; Uzbekistan [2011]; Venezuela [2000]; Vietnam [2001]; Zimbabwe [2001, 2012].

## **Independent Variables**

Our empirical analyses contain variables that capture both the demand side and supply side of religion.

## Demand Side

On the demand side, our primary independent variable is the *Human Development Index (HDI)*. We use the *Human Development Index* as our measure of societal development because it captures a broad notion of what constitutes human development. Annual *HDI* data from 1980 to 2015 come directly from the Human Development Report Office (UNDP, 2016).<sup>1</sup> We obtained the data on July 31, 2018.

3. *Human Development Index (HDI)* has a 0 – 1 scale, and is a composite measure of a country's level of human development based on three underlying dimensions.

- Health Index: The health index measures life expectancy at birth. It is calculated as:

$$\text{Health Index} = \frac{\text{Average Age at Death} - \text{Minimum Value}}{\text{Maximum Value} - \text{Minimum Value}},$$

where the minimum and maximum values were taken as 20 years and 85 years, respectively.

- Education Index: The education index measures the years of schooling in a country. It is composed of two subindices – expected years of education and mean years of education – that are combined to create the Education Index. The expected years of schooling index is calculated as:

$$\text{Expected Years of Schooling} = \frac{\text{Expected Years of Schooling} - \text{Minimum Value}}{\text{Maximum Value} - \text{Minimum Value}},$$

where the minimum and maximum values were taken as 0 years and 18 years, respectively.

The mean years of schooling index is calculated as:

$$\text{Mean Years of Schooling Index} = \frac{\text{Mean Years of Schooling} - \text{Minimum Value}}{\text{Maximum Value} - \text{Minimum Value}},$$

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<sup>1</sup>Data for the 1980-2015 time period are not available in the various annual Human Development Reports themselves. We obtained the necessary data through direct communication with an analyst in the Human Development Report Office itself.

where the minimum and maximum values were taken as 0 years and 15 years, respectively. Finally, the Education Index is calculated as:

$$\text{Education Index} = \frac{\text{Expected Years of Schooling Index} + \text{Mean Years of Schooling Index}}{2}.$$

- **Standard of Living Index:** The standard of living index is calculated using adjusted gross national income (GNI) per capita (PPP US\$). It is calculated as:

$$\text{Standard of Living Index} = \frac{\ln(\text{Actual GNI}) - \ln(\text{Minimum Value})}{\ln(\text{Maximum Value}) - \ln(\text{Minimum Value})},$$

where the minimum and maximum values were taken as \$100 and \$75,000, respectively.

The *Human Development Index (HDI)* is calculated as the geometric mean of these three normalized indices:

$$\text{Human Development Index} = (\text{Education Index} \times \text{Health Index} \times \text{Standard of Living Index})^{\frac{1}{3}}.$$

More technical information about exactly how a country's HDI score is calculated can be found at [http://hdr.undp.org/sites/default/files/hdr14\\_technical\\_notes.pdf](http://hdr.undp.org/sites/default/files/hdr14_technical_notes.pdf).

In terms of summary statistics, we have  $N = 330$ ,  $\mu = 0.74$ ,  $\sigma = 0.12$ .<sup>2</sup>

As a robustness check, we also use gross domestic product (GDP) per capita as a measure of societal development. Annual data on GDP per capita comes from version 9.0 of the Penn World

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<sup>2</sup>In Models 1-3 in Table 1 in the main text, we show the results reported by Gaskins, Golder and Siegel (2013b). The *HDI* measure used by GGS is calculated slightly differently to the one that we have just described. This difference simply reflects the fact that the United Nations Development Programme (UNDP) periodically changes how it calculates its *Human Development Index*. In our analyses, we use the most up-to-date data and calculation for the *HDI* measure. For those who are interested, a country's *HDI* score always combines information about health, education, and standard of living. However, the precise way in which this information is aggregated into a single measure has changed over time. As we have seen, the UNDP now calculates the HDI as  $(\text{Education Index} \times \text{Health Index} \times \text{Standard of Living Index})^{\frac{1}{3}}$ . When GGS conducted their analyses, the HDI was calculated as  $\frac{1}{3}\text{Education Index} + \frac{1}{3}\text{Health Index} + \frac{1}{3}\text{Standard of Living Index}$ . More information about exactly how the *HDI* score was calculated in the analyses conducted by Gaskins, Golder and Siegel (2013b) can be found in their [Online Appendix B](#).

Tables (Feenstra, Inklaar and Timmer, 2015). The data were downloaded on August 6, 2017.<sup>3</sup>

4. *GDP per capita* measures expenditure-side real GDP per capita in thousands of 2011 purchasing power parity US dollars. In terms of summary statistics, we have  $N = 345$ ,  $\mu = 19.11$ ,  $\sigma = 15.29$ .

### Supply Side

Our primary focus in this paper is on the demand side of religion. However, we also incorporate the supply side of religion using variables from the aggregated International Religious Freedom (IRF) Data (Grim and Finke, 2006), which can be found in the [Association of Religion Data Archive](#). The data were downloaded on August 4, 2017. Since 1999 U.S. embassies have produced an annual International Religious Freedom Report on their host country. Together these reports cover 196 countries. The IRF data codes these reports using a 243-item coding instrument (questionnaire). As Grim and Finke (2006, 9) note, “reporting adheres to a common set of guidelines, and training is given to embassy staff, who investigate the situation and prepare reports . . . Once an embassy completes a report, this report is vetted by various State Department offices that have expertise in the affairs of that country and in human rights.” The coding of all 196 countries was done by the lead rater. Two other raters coded 142 of the 196 countries. The inter-coder reliability was high, with a Cronbach’s alpha of 0.9047 (Grim and Finke, 2006, 12). We use two variables from the IRF dataset: *Government Regulation* and *Social Regulation*.

5. *Government Regulation* is defined as the restrictions placed on the practice, profession, or selection of religion by the official laws, policies, or administrative actions of the state. *Government Regulation* is a summary measure coded on a 0-10 scale based on six underlying questions:

1. Does the report mention whether foreign missionaries are allowed to operate. 0 = allowed and/or no limits reported, 1 = allowed, but within restrictive limits, and 2 = prohibited.

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<sup>3</sup>The GDP per capita data used by Gaskins, Golder and Siegel (2013b) come from version 6.1 of the Penn World Tables.

2. Does the report mention that proselytizing, public preaching, or conversion is limited or restricted. 0 = no, 1 = yes, but (equally) for all religions, 2 = yes, but only for some religions.
3. Does the report indicate that the government interferes with an individual's right to worship? 0 = no, or no interference, 1 = some interference, 2 = severe interference.
4. How is freedom of religion described in the report? 0 = law/constitution provides for freedom of religion and the government 'generally respects' this right in practice, 1 = law/constitution provides for freedom of religion and the government generally respects this right in practice, but some problems exist, e.g., in certain locations, 2 = limited and/or rights are not protected, 3 = does not exist.
5. Does the report mention that the government 'generally respects' this right in practice? 0 = yes, 1 = yes, but exceptions or restrictions are mentioned, 2 = the phrase 'generally respects' is not used.
6. Does the report specifically mention that the government policy contributes to the generally free practice of religion. 0 = yes, 1 = yes, but exceptions are mentioned, 2 = no.

To construct *Government Regulation*, each of the six underlying variables was rescaled to a 0 to 1 range, and then multiplied by 1.6667 to give an additive maximum of 10 (Grim and Finke, 2006, 13). In terms of summary statistics,  $N = 339$ ,  $\mu = 2.86$ ,  $\sigma = 2.76$ .

6. *Social Regulation* is defined as the restrictions placed on the practice, profession, or selection of religion by other religious groups, associations, or the culture at large. This form of regulation might be tolerated or even encouraged by the state but is not formally endorsed or implemented by government action. *Social Regulation* is a summary measure coded on a 0-10 scale based on five underlying questions:

1. Social attitudes towards other or nontraditional religions are reported to be 0 - amicable, 1 = discriminatory (but not negative), 2a = negative just in certain areas, 2b = negative just wards



certain religious branches, 3 = both 2a and 2b, 4 = hostile.

2. According to the report, what are social attitudes to conversions to other religions? 0 = no problems reported, 1 = some tension, 2 = negative, 3 = physically hostile.
3. Does the report mention that traditional attitudes and/or edicts of the clerical establishment strongly discourage proselytizing? 0 = no, 1 = yes.
4. According to the report, do established or existing religions try to shut out new religions in any way? 0 = no, 1 = yes.
5. What is the situation regarding social movements in relation to religious brands in the country? 0 = none or amicable, 1 = flashes of activity, 2 = regional and organized activity, 3 = national and organized activity.

To construct *Social Regulation*, each of the five underlying variables was re-scaled to a 0 to 1 range, and then multiplied by 2 to give an additive maximum of 10 (Grim and Finke, 2006, 19). In terms of summary statistics,  $N = 339$ ,  $\mu = 5.28$ ,  $\sigma = 2.63$ .

## Controls

In order to match the empirical analyses conducted by Gaskins, Golder and Siegel (2013b), we included a number of control variables. One control variable, *Income Inequality* deserves more discussion and so we start with that.

7. *Income Inequality* is an estimate of the Gini index of inequality in equivalized (square root scale) household disposable (post-tax, post-transfer) income. The data are from version 6.0 of the Standardized World Income Inequality Database (SWIID) (Solt, 2016a).<sup>4</sup> SWIID uses “a missing-data multiple-imputation algorithm to standardize observations collected from the OECD Income

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<sup>4</sup>In their original research, Gaskins, Golder and Siegel (2013b,a) measure income inequality using the Standardized Income Distribution Database (SIDDD) from Babones and Alvarez-Rivadulla (2007). The SWIID dataset extends the coverage of this database and employs a more rigorous methodology for constructing cross-nationally comparable measures of income inequality.

Distribution Database, the Socio-Economic Database for Latin America and the Caribbean generated by CEDLAS and the World Bank, Eurostat, the World Bank's PovcalNet, the UN Economic Commission for Latin America and the Caribbean, national statistical offices around the world, and academic studies while minimizing reliance on problematic assumptions by using as much information as possible from proximate years within the same country. The data collected by the [Luxembourg Income Study](#) is employed as the standard" (Solt, 2016b). The SWIID maximizes the comparability of income inequality data across the broadest possible set of cases and is "ideal for broadly cross-national work" (Solt, 2016a, 1280). The SWIID currently contains comparable Gini indices of income inequality for 192 countries for as many years as possible from 1960 to the present. The data were downloaded on August 5, 2017. In terms of our particular country-survey dataset, we have 320 observations on *Income Inequality*.

The fact that the SWIID attempts to combine information on inequality from numerous datasets means that its estimates of income inequality are measured with uncertainty. This measurement uncertainty is primarily a result of any remaining incomparability in the different measures of income inequality after the standardization procedure has been implemented. This uncertainty is captured in the way that SWIID, instead of reporting just one estimate of income inequality for each country-year, reports 100 income inequality estimates, each of which is a draw from the posterior distribution produced by the algorithm used to standardize the different sources of income inequality data. To incorporate this uncertainty into our empirical analyses, we run our statistical model 100 times, each time using a different one of the 100 variables that report the uncertainty in the SWIID estimates. We then report the average of these results.<sup>5</sup>

8. *Communist* is a dichotomous variable indicating whether a state is communist.  $N = 348$ ,  $\mu = 0.03$ ,  $\sigma = 0.17$ .

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<sup>5</sup>The data in the SIDD from Babones and Alvarez-Rivadulla (2007) include only one estimate for income inequality. As a result, the original analyses by Gaskins, Golder and Siegel (2013b,a) did not take account of the uncertainty in their income inequality variable.

9. *Postcommunist* is a dichotomous variable indicating whether the state had previously been communist.  $N = 348$ ,  $\mu = 0.27$ ,  $\sigma = 0.45$ .

10-12. *Percent Catholic*, *Percent Protestant*, *Percent Muslim* measure the percentages of the population comprised by Catholics, Protestants, and Muslims. The data for these variables come from [Alesina et al. \(2003\)](#) and were downloaded on August 4, 2017. For *Percent Catholic*, the summary statistics are  $N = 343$ ,  $\mu = 31.96$ ,  $\sigma = 36.01$ ; for *Percent Protestant*, the summary statistics are  $N = 343$ ,  $\mu = 16.90$ ,  $\sigma = 26.81$ ; and for *Percent Muslim*, the summary statistics are  $N = 343$ ,  $\mu = 15.91$ ,  $\sigma = 31.41$ .

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